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Journal of the Society of Arts.

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FRIDAY, APRIL 12, 1867.

Announcements by the Council.

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Ordinary Meetings.

Wednesday Evenings at Eight o'Clock:—

April 17.—*Passion Week.* No Meeting.

Cantor Lectures.

Mr. Hullah's course, "On Music and Musical Instruments," will be extended by two additional lectures, as follows:—

Lecture VII.—Monday, April 29.

Musical Instruments (*continued*).—The Bow—The Key-board—The Violin—The Organ—The Clavichord.

Lecture VIII.—Monday, May 6.

Modern Instruments, Chamber and Orchestral.—The Pianoforte—Combination of Instruments—The Orchestra.

The lectures commence at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

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Food Committee.

The Sub-Committee on Milk met on Wednesday, March 20th. Present—Mr. Benjamin Shaw, in the Chair; Mr. James Caird, Mr. Harry Chester, Mr. McClagan, M.P., Mr. C. S. Read, M.P., Mr. Ludford White, and Mr. E. Wilson.

Mr. Alexander Wood (having attended on the invitation of the sub-committee) stated that he was Deputy-Chairman of the Great Western Railway, and was acquainted with the general arrangements for the transit of milk on that line. Milk had been carried on that line for some years, but the extension of that traffic was best shown by the return he had before him, which gave the quantity of milk carried monthly from January, 1865, to February, 1867, and during that interval the increase in the quantity carried was very large. In the month of January, 1865, there were carried 1,051 cans, containing 8,954 gallons, and realising a revenue of £55 1s. 10d. In January, 1866, the quantity carried during that month was 12,611 cans; so that in one year it jumped up from 1,051 cans to 12,611, containing 143,600 gallons, which was a very large increase in so short a time, and the revenue had increased from £55 odd to £719. That was about the period when the rinderpest was at its height, and no doubt that marked increase in the quantity of milk sent to London from the country dairy districts was due to the disappearance of the cows from the London cow-sheds. Going on to January in the present year he found the quantity was rather stationary. In that month the number of cans carried was 12,539, containing 143,588 gallons, producing a revenue of £718 16s. 5d. That was very nearly, indeed, the quantity that was carried in the corresponding month of 1866. During the last twelvemonths the trade had been almost stationary, not having much increased. In the intermediate months there was sometimes an increase, but it went down again afterwards. At the present time the quantity carried was slightly on the decrease. The largest quantity carried in any one month was in May last, when there were 16,706 cans, containing 285,918 gallons. In June there was not much difference; in that month there were 16,000 cans and 221,851 gallons. The larger quantity of this milk came from Purton, about six miles below Swindon, and 100 miles from London. At Swindon you get into the dairy districts of Wiltshire. The supply begins in the long valley of Berkshire, below Reading, and there you get into the grass country continuing to below Swindon.

Mr. Chester—Do the directors of the Great-Western Railway take any special steps to encourage this traffic, or is the supply left to develop itself?

Mr. Wood—This traffic has sprung up very suddenly, and the traffic-managers have been compelled to do the best they could to meet the sudden wants of the trade, and of course they take pains to do so. A number of old second-class carriages were as quickly as possible converted into milk-vans; but with regard to the cans in which the milk was carried the trade provided them.

Mr. Chester—Are there any regulations as to the size and shape of the milk-cans?

Mr. Wood—No; it was difficult to insist upon the traders, who found their own vessels, conforming to a particular description of can. When this milk-trade commenced, knowing that there is a very large milk-trade on the French railways, the general manager put himself in communication with officials in Paris, and obtained a specimen of the cans used in France. He was sorry they had not been able to induce the trade here to use a uniform description of can.

Mr. Caird—Do you consider that the French cans are better adapted for the purpose than those used in this country?

Mr. Wood thought they were. The French cans were only about half the size of those used here. Our cans were much too large and too heavy to be loaded and handled by one man. Whether the larger bulk of milk carried in each can had a prejudical effect upon the milk he was unable to say; but with regard to the handling of the cans at the stations, he thought the smaller-sized cans used in France were more convenient. The shape of the French cans was more convenient for packing in the vans. Our cans are broad at the bottom and tapering towards the top. The French cans, from their shape, could be packed with greater economy of space. The French milk trucks are very much like the narrow-gauge sheep-truck used in this country, with two floors, one above the other—two tiers, in which a great number of cans could be packed, and there was a circulation of air all round them. He thought one of the defects in carrying milk was carrying the cans in enclosed vans, because there was sometimes an escape of milk, which became sour, and he thought a circulation of air through the van was beneficial.

Mr. Chester—Are you aware whether the milk cans in France haveany covering over them in hot weather?

Mr. Wood—Yes; they have a linen covering, which is watered and kept wet. We had recommended our officers to invite traders to do the same thing in summer-time; but only a few put a hayband round the top of the cans. In France the linen cover completely envelopes the cans, and when they were brought from a long distance they are watered during the journey, and the evaporation keeps the milk cool. The great merit he saw in the French cans was this. In carrying milk long distances by railway there was difficulty in preventing its churning, and the milk, when that process had commenced, was less valuable, from being carried a long distance, than milk which was brought from a much less distance in which no churning had taken place; and in which there was no separation of the fatty matters by the motion of travelling. The French get over that difficulty by completely filling the cans, and by having the top so arranged that it dips into the milk, and is kept in place by a screw stopper. By this means the milk becomes fixed tightly in the vessel, and thus no churning can take place.

Mr. Read—Have you any specimens of the French milk cans here?

Mr. Wood believed there was one at Paddington, which he would be happy to send for the inspection of the committee. He did not consider the milk cans used in this country were adapted for carrying milk long distances. The cans were closed by a perforated top, and sometimes with a cloth round it, and if these cloths were not carefully washed there was an impurity which tainted the milk. The treatment of milk required the greatest cleanliness throughout. These cloths were sent backwards and forwards, and were not always as clean as they ought to be. The perforated top was so made because the milk was too frequently put in hot. It should be quite cold before it is despatched.

The Chairman remarked that he understood one difficulty with regard to the supply of milk to London from the provinces was with regard to cream. Till the milk could be brought in a state to yield cream, the case for the abolition of the London cow sheds was not met.

Mr. Wood said, having occasion to go to Paris on railway business he made a point of seeing how the milk traffic was carried on on the Western of France railway.

The Chairman—Does not the deterioration or not of the milk depend a good deal upon the springs of the truck in which it is carried?

Mr. Wood replied: If the milk were properly secured in the cans in the way he had pointed out, there was, he thought, a remedy at once against churning.

Mr. Caird—The milk-trade in Paris is very considerable. Have the railway companies provided any special carriages for the conveyance of the milk, so as to furnish a supply of air to the cans in the transit; and has there been, as far as you are aware, anything of the same kind done on the English railways?

Mr. Wood apprehended the traffic in milk was not at present, on any railway in this country, of sufficient extent to lead any company to provide special trains for its conveyance, further than he had pointed out in the conversion of carriages for the purpose, as had been done on the Great Western.

Mr. Caird—Is it a new trade?

Mr. Wood—Comparatively a new trade.

Mr. Caird—Looking to the propabilities of the increase of this traffic, do you think the railway companies would be likely to provide special vehicles for the carriage of milk?

Mr. Wood said that, as he had before stated, there had been lately no marked increase in the quantity of milk carried on the Great-Western Railway; at the same time he considered it would be to the interest of the railway companies to promote this traffic as much as possible, and to give every facility for it.

Mr. White—Do you think the traffic in milk on the Great Western is sufficient to warrant the company in providing daily special trains for it?

Mr. Wood said it was to the interest, both of the company and the producers of milk, to make the arrangements for its carriage as perfect as possible. He had put the question to the traffic superintendent, as to whether the milk traffic was large enough for special quick trains, and he expressed an opinion that it was not, at present. In France there were, he believed, special milk trains, but there was this difference in France, as far as he could ascertain—they were satisfied with one train per day, in and out, consequently one milking per day only was sent out. It was so on the Western of France. Two trains per day would be required for the milk trade of London.

Mr. Caird—Was Mr. Wood aware whether there were any special arrangements made by the railway companies for the distribution of the milk when it reached Paris?

Mr. Wood—There, again, there was a difference. As far as he was able to observe, in Paris a uniform description of van was employed in taking the milk from the station and bringing back the empty cans. He was not aware whether that was an organisation on the part of the railway company or on that of any individual or company formed for the purpose.

Mr. Caird, looking to the fact that milk was retailed in London to the consumers at a price more than 100 per cent. beyond what the dealers paid to the producers, suggested that the price to the consumers might be reduced, by an organised system for the distribution of the milk on its arrival in London, as compared with the present system. He would be glad to hear from Mr. Wood whether he thought there were any means by which the railways could bring the milk more within the reach of the consumers, and, at the same time, give a larger proportion of profit to the producer.

Mr. Wood—He did not prosecute his inquiries beyond the transit on the railway. But, as he had said, he observed, on the arrival of a milk train, carts of the same construction were employed in carrying the milk from the station, and the same description of vehicles brought back the empty cans. He could not say whether these carts belonged to the administration of the railway, or whether they were provided by intermediate parties, who devoted themselves to the transit of this description of cans to and from the railway station. He had no doubt, by arrangement at the clearing house, the railway managers might be able to agree upon the right form of can, and he had no doubt the railway companies generally would adopt them. The milk was not delivered by the company in the case of the Great Western Railway when it reached Paddington; the rate of carriage was so low it would not pay the company to deliver. At present the milk was brought by slow passenger trains—not parliamentary trains, but mixed trains, which stopped at most of the stations. If the traffic could be brought into greater regularity it would assist the service, because there was great delay in moving these large cans from the stations.

Mr. Chester—Are the English milk cans single-skinned or not?

Mr. Wood—Single-skinned. The linen covering over the French cans completely envelopes them; and being kept wetted, cooling is effected by the evaporation going on as they pass through the air. Possibly, the heat being greater in France than in this country makes such an arrangement for keeping the milk cool more necessary.

The Chairman—As soon as it could be proved that the milk could be brought to London in a satisfactory condition for the use of the consumers, it would no doubt assist the movement that was going on in many of the metropolitan parishes for the entire abolition of the London cow-sheds.

Mr. Caird remarked that it was the custom of railway companies to deliver certain goods; and he suggested whether a sufficient rate might not be charged for the conveyance of the milk to cover the expense of delivering it to the consignees, under arrangements that would insure this being done as rapidly as possible after its arrival.

Mr. Wood saw no reason why the milk rates should not include delivery by the company.

Mr. Caird suggested that would probably reduce the cost of distributing the milk in London.

Mr. Wood hardly knew as to that, but as at present every owner of a milk walk had his own conveyance, the trade generally would have to be consulted.

Mr. Caird—Inasmuch as the different large milk dealers would receive their supply on their own premises, instead of having to send special conveyances of their own to take the milk from the station.

Mr. White suggested that, in the delivery of an article like milk, time was a very important element. The milk was required to be distributed in London at certain times to suit the trade of the retailers.

Mr. Wood—With regard to the speed of delivery, the people who went to the station for the milk would be likely to get it conveyed to their premises as speedily as possible. He did not think any arrangements of the kind suggested on the part of the company would expedite the distribution of the milk in London. He was disposed to think, if a very large development of the milk trade took place, some intermediate agency might spring up for the delivery to the dealers. Private enterprise generally springs up in such cases to provide what was wanted if the business was large enough to require it.

Mr. Chester—Is it found that in proportion as the quantity of milk carried on the Great Western increased, the quantity of butter carried on the line diminished ?

Mr. Wood replied that he had no statistics of the quantity of butter brought by the railway from these districts, but he had no doubt the quantity of butter brought over that line, as soon as the extended communication with Ireland was completed, would be immense. At the present time very little fresh butter was sent up the line, but he believed sufficient butter might be sent from Ireland for the supply of the whole of London. At present barely any fresh butter reached the metropolis from Ireland; but when he told the committee that the value of the salt butter sold in Cork market, the year before last, amounted to a million and a half sterling, when quick communication between this country and the south of Ireland was established, it might be conceived that the enhanced price of fresh over salted butter would lead to the introduction of very large supplies of that article from Ireland into the metropolis. He believed any quantity of butter that was required might be had from the south of Ireland. The shortest sea-passage was from Milford Haven, but it was the longest land route. There was this peculiarity about Milford Haven, that it was not a tidal port. A trade in fresh butter from Ireland presupposed quick transit; and butter was an article that must be conveyed rapidly, and should be subjected to as little handling in trans-shipment as possible. When the new Metropolitan Market was opened next year, the railway arrangements in connection with it would be such that the produce of fresh provisions from the south of Ireland could be brought direct into the market without any handling at all.

Mr. C. S. Read—Does much fresh butter at present come to London from South Wales ?

Mr. Wood—Very little, if any, butter was sent from that district, because the consumption was very large amongst the numerous population employed in the works of that district. They were importers rather than exporters of butter. Butter and provisions of that description were sent from Pembroke and Glamorgan to the works. The great producing country for all *fresh* provisions was Ireland; but private enterprise in the South hitherto, unfortunately, had not been much directed to that trade. The year before last he visited Waterford, to ascertain whether there was any large trade in the export of fresh butter from that place; but he found that although the quantity brought into the market was large, only one person was engaged in sending fresh butter from Waterford to London; but he believed that business was extending. Two new steamers were about to be put on that line; at present the steamers were not very rapid. There were rates for the carriage of butter on the Great Western Railway. Cork was the great market for salted butter, and the landed interest and country gentlemen there were very anxious to open out the fresh butter trade with this country. There was a great peculiarity in the butter trade of Cork. Both buyers and sellers of butter in the Cork market were subjected to the rules of the market. It was thought by some persons that those rules had a prejudicial effect upon the trade of the market, and an unsuccessful attempt was made last year to alter them. Law proceedings took place; the trial lasted nearly a fortnight, and the result was to uphold the rules of the market; so that at present the butter trade of Cork was exclusively in salted butter, from which all foreigners were excluded.

Mr. White—Would an English buyer, in this sense, be regarded as a foreigner ?

Mr. Wood—Every buyer, whether Irish or English, was so regarded. The reasons were these:—The Cork butter was sold for export and shipping purposes; and to keep up the brand, all butter brought into the market was subjected to a certain test, and the casks were branded accordingly. There might have been reasons for the original introduction of these rules, but there were some people who thought they were now carried too far, and that they interfered with free trade. It would be a great boon to this country to establish quick communication with the south of Ireland for the fresh provision trade. The great difficulty was to establish steam communication, on account of the expense. His own company had not yet organised a service, because it was thought that the best time to introduce this produce would be when the new Smithfield Market was opened, to which access would be had by the railway, and he believed that would be completed in twelve or sixteen months from this time. The trains would then go in underneath the market, and the produce brought would be raised by lifts direct into it so that all the intermediate handling of the provisions, which was so prejudicial to them, would be obviated, and the produce would arrive in the finest possible condition. A prejudicial effect upon fresh provisions brought to London at present was produced by the handling between the arrival at the railway station and its delivery in the market, and that especially applied to the dead meat trade.

The Chairman—Would the New Smithfield Market include such articles as butter ?

Mr. Wood—He believed arrangements would be made for trade in all articles of fresh provisions. Mr. Taylor, the Chairman of the Market Committee, would probably be able to give this Committee valuable information on these points.

Mr. Chester—Would any large traffic in Devonshire clotted cream be carried on on the Great Western Railway ?

Mr. Wood said he had no details with respect to that.

Mr. White—Did Mr. Wood consider milk was more injured by being conveyed 100 miles than 25 miles ?

Mr. Wood thought under proper management milk might be carried long distances without material deterioration. The limit of distance would be the cost of the carriage. He thought it would be only during a short period of the year, when the weather was hottest (if at all), that the linen coverings of the cans would be necessary, if the cans were completely filled so as to prevent the milk being shaken, and if they were carried in trucks which admitted a free current of air through them. If the London trade would be satisfied with one delivery of milk per day, the traffic could be very easily managed; but at present two deliveries per day were required. There might, he thought, be arrangements for a milk train to run at night, and that would be a good thing during the very hot weather.

Mr. Chester inquired whether, in the opinion of Mr. Wood, it would be useful if the Society of Arts offered a premium for an improved milk can, and another premium for an improved milk carriage for the railways.

Mr. Wood thought it would be extremely useful, and it would no doubt lead to a good competition in both these matters. If that were done he had no doubt the people in the carriage department of his own railway would be competitors for the improved milk van. If this committee were now on the subject of meat he would suggest that good might be done by the offer of a premium by the society for an improved meat van, to be used on railways, because there was great difficulty in the structure of a proper meat van, and he had no doubt the offer of a premium would lead to some valuable suggestions. They wanted air and even temperature; but while admitting air they had difficulty in keeping out dust. At present there was difficulty in the carriage of meat on railways. If it was suspended, and the weight was on the top of the van, that was objectionable in rapid travelling by railway, from the vehicle being top-heavy. It was well known that fresh meat was very much deteriorated by frequent handling, and in any improved van he thought attention should be given to providing a means for obviating as much as possible the necessity for handling the meat in the transit from the railway to the market. The more untouched the provisions arrived in the market the better their appearance was. On the subject of the carriage of live cattle from Ireland and the Continent, Mr. Wood stated that, from the examinations he had made into that matter, he was of opinion that there must be soon a great change in the mode of conducting the transit of live animals. He had no doubt that the injury done to the agricultural interest of Ireland by the mode of transit of live stock was beyond what people would credit except those who had gone into the subject. The rapid passing of objects on a railway in the present cattle trucks had a great effect upon the brain of the animal, and no doubt that affected the state of the blood; and the way in which they were obliged to be arranged in the trucks for the sake of economy of space, had also a very deteriorating effect up onthe animals in a long journey.

Mr. White inquired whether Mr. Wood had the means of knowing to what extent an animal was likely to be deteriorated in weight by the journey from Ireland to this country?

Mr. Wood could not state what the loss of weight was, but he had been informed that dead meat sent from Aberdeen to the London market would remain good for at least two days longer than that of the animals which were brought from a long distance and slaughtered in London. He thought the powers of the Board of Trade, under the Coasting Passenger Steamers Act should be extended to the exercising of control over the cattle steamers; and that the cross-channel trade in cattle should be restricted to boats specially licensed for that purpose. There was, no doubt, a vast amount of cruelty to which the animals were exposed in the sea-passage; and he believed he quite spoke within limits when he said the cattle brought over to this country from Ireland suffered a great deterioration of their value. In conclusion, Mr. Wood stated that under arrangements which were now being carried out, he had no doubt a very large augmentation would take place shortly in the supplies of all kinds of fresh provisions from Ireland, and especially in that of fish.

The chair was then taken by the Right Hon. H. A. Bruce, M.P.

Mr. Nicholson, in reply to interrogations put by Mr. Chester and other members of the Sub-Committee, stated that he was chief clerk of the parcels department of the Great Western Railway Company, and was acquainted with the arrangements for the transit of milk, that traffic being under his charge. He was unable at the present moment to suggest any definite mode by which an improvement could be effected in the means of carrying milk from the provinces to London. The officers of the company wished to introduce smaller milk-cans, similar to those used in France. There was one of those cans now at Paddington, and he would send it for the inspection of the Committee. The farmers objected to those cans, because they were air-tight. The milk was put into the cans warm, and they considered it necessary to have air-holes to allow the steam to escape. He thought it would be better to put the milk into the cans cool, and fill them up, so as to prevent the churning of the milk by the shaking of the carriage. Some farmers placed the cans in a stream of water to cool the milk after they were filled, and before they were sent away. He believed the milk was put into the cans, in France, in a cool state. He presumed the cans would be placed in water to cool the milk, as was done by some dairymen in Wiltshire. The objection to the cans at present in use was their large size, rendering them inconvenient to handle. On the Great-Western line the sum of 2d. per can was charged for taking back the empties, and the dealers objected to having cans of half the present size because it would add so much to the expense of the carriage of the empties.

The Chairman said at present that was not so much the question as the effect which the carriage in the larger or the smaller vessel had on the milk itself.

Mr. Nicholson could not speak on that point. The objection to the present large cans, holding nine barn gallons, equal to eighteen imperial gallons, was their weight in loading and unloading, requiring two persons to lift them. The French cans were not more than half the size of the English. The milk was carried by the stopping passenger trains, and no trains had been put on specially for that traffic. The milk trains were those which arrived at Paddington at 4·30 a.m., at 12·30, and 9·30 p.m. and 11·10 p.m. Each dealer sent his cart to the station for the milk he required. The way the trade was conducted was, all the milk that was sent up by the farmers was consigned to several wholesale dealers in London, who on its arrival sold to the retailers the quantity they required, and they took it away in their own conveyances, and he believed for the most part in their own cans, so that most if not all the cans that came up were emptied without being taken away from the station; they were then sent to the other side of the line and returned as empties. There was no competition for the milk amongst the salesmen at the station, the price being agreed to amongst themselves, and the whole quantity being consigned to them. It was not what could be termed a milk market at the station, as there would not be sufficient accommodation for that. Each salesman appeared to have his regular customers each day. The French milk van was like a narrow-gauge sheep truck with two tiers. He believed there would be great objection to a sudden change in the size of the cans, owing to the expense of providing new cans of half the size, as the present stock of cans was very large and would last for several years. He believed the milk cans now used would last for five or six years with occasional repairs. The French cans were made of stouter metal than the English, and inhot weather they were covered with a linen cover to keep the milk cool during the journey. He could not say whether the cans in France belonged to the railway companies or not, or whether the milk was distributed by them on its arrival. The principal supplies of milk on the Great Western Railway were from the neighbourhood of Swindon, Purton, and Cricklade, and that was the longest distance from which it was brought into London, being from 70 to 100 miles. Swindon was the principal station from which the milk was taken. The effect of the cattle disease was to cause a larger quantity of milk to be sent by the railway on account of the disappearance of the cows in London. The trade was not increasing at the present time, but rather the reverse. He attributed that in some degree to the competition of other railways. Large quantities of milk were brought up by the London and North-Western and the South-Western; also by the Great Eastern.

Mr. Chester—The railway which afforded the greatest facilities for this traffic would be likely to have the largest trade in that article.

Mr. Nicholson said the Wiltshire milk was esteemed for its excellent quality, and had a preference with many of the dealers. He was not in possession of any particulars with regard to the traffic in butter on the Great Western Railway. He regarded the question of the reduced size of the milk-cans as important, not only for the convenience of handling by the railway porters, but also for the conveyance of the cans from the farm to the station. The milk would be less shaken in cans of a size that a man could carry than in the present large cans, which were wheeled about on the edge of the bottom, and there would, he thought, be less damage to the cans themselves. There was no provision made at the stations for receiving the milk from the farmers beyond the cans being placed on the platform to await the arrival of the train that took them on. The change from the larger to the smaller cans would occasion great inconvenience to the traffic, unless it were done uniformly throughout the trade, and at once, as the same quantity of milk had to be carried whether it were carried in large or small cans, and a truck that would be adapted for the larger cans would not be available for the smaller size without great waste of space in the height of the truck. With two sizes of cans two descriptions of trucks would be required, and that would tend to obstruct the traffic rather than facilitate it. If the railway companies decided to insist upon the small cans being used entirely, it would be necessary to give the farmers and dealers at least three or four months' notice of that intention. It was quite necessary that the change, if adopted, should be general. The number of separate cans in use on the Great Western Railway, in the month of January, 1866, was 11,539. On an average there were about 500 cans carried to and fro daily. The cans were of the value of about 32s. each when new. There would be, he imagined, somewhere about 2,000 cans in use in this trade on the Great Western Railway, as it was necessary for the dealers to have a reserve of cans. They generally put into each can only eight barn gallons, but they mostly held nine gallons. He thought the reduction in the size of the cans would not reduce the rate at which the milk was carried on the railway, inasmuch as on the arrival of the train at the stations it was the rule for the milk dealers' men to assist in loading the cans, as it enabled the train to start away quicker. The French cans were of much thicker metal than the English, being something like galvanized iron; but if the English cans were made half the size, they would not require to be made so strong in proportion as the present large cans in use; and they were strengthened very much by tin hooping round them. They were from four to five feet in height, and not uniform. He should say the introduction of small cans would be a decided improvement in the milk traffic on railways. The milk brought up to Paddington was principally sold to about ten dealers, and there were thirty or forty retailers' carts ready to take the milk away on its arrival, after it was sold by the dealers. He did not think the distribution of the milk over London could be effected quicker than in that way.

The Chairman inquired whether Mr. Nicholson thought it would be too harsh a measure to give notice to all the milk producers that, after a certain time—say six months – no milk would be carried by the railway except in cans of a certain size?

Mr. Nicholson replied it might have the effect of driving the trade to another line from that which adopted that course. It was generally found that the railway which gave the greatest facilities for traffic got the largest trade. There were other railways which competed with the Great Western in certain districts. The South-Western was a competing line, and also the London and North-Western at Aylesbury, &c. The Great Western had the command of the district of Swindon, Parton, and Cricklade. If a decision were come to by the company to insist upon a smaller size of can being used, the notice, in his opinion, ought not to be less than three months; but it was a question whether other companies would consent to impose such restrictions. It would be an advantage to every company to have the smaller cans used, as they could be loaded and unloaded quicker. The great bulk of the milk brought to Paddington did not come from a greater distance than 70 or 80 miles.

Mr. Le Neve Foster remarked that, according to returns sent to him, it appeared that the greatest distance from which it was brought by the South Western was from Wareham and Salisbury.

Mr. Nicholson added he thought it would be expedient to have special trains for milk if the trade sufficiently developed itself, and carriages had been specially fitted up for the milk trade on the Great Western line; old carriages had been converted for the purpose; but he thought, with Mr. Wood, that good would be done by the offer of a premium for an improved construction both of vans and cans for the carriage of milk. As he had stated, an admixture of large and small cans together would be productive of great inconvenience in the loading of the trucks. The milk trade to London had always been of an uncertain character, and had only sprung up on the Great Western line to any extent since 1865. A very large quantity was sent up last year, but at present it appeared to be falling off, and might continue to do so as the stock of cows in London and the neighbourhood increased. At present he did not see his way to any great practical improvement being effected in the milk traffic to London. No doubt the great increase in the quantity of milk sent up in 1866, was owing to the deficiency of the supply from London itself, and as the local supply was increased, the provincial supplies would probably decrease. The returns for the two months expired in the present year, showed a considerable falling off in the quantity as compared with that of the corresponding period of the previous year.

Cantor Lectures.

"On Music and Musical Instruments." By John Hullah, Esq.

Lecture VI.—Monday, April 8.

Mediæval Instruments, &c.

After briefly alluding to some statements which he had made in his fifth lecture, respecting the different classes of instruments, Mr. Hullah proceeded to speak of the condition of these instruments, of the changes they underwent, and the additions that were made to them during the middle ages. The conquerors of the old world—the barbarians who broke up the Roman empire—found everywhere in the south of Europe specimens of ancient musical instruments, and artists skilled in the use of them. These remained in use for a considerable time. But the same influence which acted so strongly on the religion, politics, manners and customs of the south soon made itself felt on the arts. For our knowledge of mediæval instruments we are as much dependent on pictorial and plastic representation as in the case of those of higher antiquity; but happily, more of this representation has come down to us. Of the instruments themselves, few anterior to the 15th century remain. But for the notoriously irreverent spirit of the Renaissance, the all but total disappearance of things made of such durable material, so strongly put together, and taking up so little room as many of these instruments, would be unaccountable. Few even of the beautiful organ cases of the best period of Gothic art have come down to us. Posterity however, has dealt with the Renaissance instruments as the Renaissance artists dealt with those of their predecessors. Specimens of some, no longer in vogue, of the 17th and even of the last century are hard to find. Who, for example, has seen a chest of viols, once an indispensable complement to a well-appointed household? Even the harpsichord is as unknown to the present generation as the shalm or the arch-lute. But if the instruments have, for the most part, perished, we have abundant evidence of what they were in the beautiful sculpture, illuminated books, and decorated walls and ceilings cotemporary with them, and also in descriptions by the theorists, who wrote while they were in vogue. The diagrams on the walls were, Mr. Hullah said, selected from such sources, which were always thoroughly reliable; for no mediæval artist ever dreamed of leaving out what he saw, or putting in what he did not see, for the sake of effect. From mediæval monuments we learn that several instruments in use in the south at the time of the earliest immigrations of the northmen, were adopted by them; and that others, differing in form from these, and even indicating new methods of producing musical sound, were in use before painters or sculptors attained or recovered sufficient skill to represent them correctly. Among wind instruments the trumpet is most frequently found in representations of the manners and customs of the northmen. The first trumpet was, no doubt, literally a horn (*cornu*). In dimensions, these instruments varied considerably. Some were small enough to be held by the performer, others equalled him in height, and almost in bulk. Their pitch would of course vary with their dimensions. In timbre they probably resembled our trombone. In a MS. antiphonary of the 9th century there is a drawing (a copy of it was on the wall) of a trumpet in which the tube is folded back, and in which there is an indication of a slide, the characteristic member of the sackbut, the precursor of the trombone. Though the traverse flute was known even to the Egyptians, the flute-à-bec seems to have been used exclusively during the middle ages. Mediæval, like more ancient flutes, were single and double, and the same uncertainty prevails as to the tuning of both. Mediæval writers often include under the name *flute*, instruments which must have had more resemblance to the oboe; since they consisted, not of a single pipe, but of a pipe enclosing a vibrating tongue, or reed. Such instruments were sometimes distinguished as recorders. Of the flute there were in England in early times several different sizes, for playing in concert, the largest of which was probably six feet in length. The quality of these instruments must have been sweet, but their intensity very limited. In the reed instruments the tone was produced by the vibration of single tongues, or by the beating together of pairs of tongues. The former is the simpler, and probably the earlier form, the calamus, or typical reed of antiquity. Indeed the most important of mediæval single-reed instruments bore a name derived from that of its prototype. The word shawm, or shalm is obviously connected with the French *chalumeau*, the Latin *calamus*, and Greek καλαμος. The shawm, frequently mentioned in our translation of Scripture, was the ancestor of the clarionet, which, before the latter part of the last century, was a military or out-door instrument, as would seem to have been the shawm, and indeed all the reed instruments of the middle ages. So with the oboe, now essentially a concert instrument. The plays of Shakspeare abound in directions for the introduction of the oboe on the entry of great personages, and in battle scenes it is often coupled with alarums. In England the oboe was called also the wayte, a word applied to watchmen, part of whose duty it was to pipe the hours of the night. There was a considerable variety of oboes—an oboe d'amore, and an oboe da caccia, the compass of which was nearly the same as that of the cor anglais, or corno inglese, still frequently used for obbligatos. But the favourite reed instrument of the middle ages was the bagpipe, which is by many supposed to be peculiarly a Scottish instrument. This is a great error. The bagpipe, of immense antiquity, has been found among nations more remote, and, seemingly, more unconnected with one another, than any instrument demanding the same skill in its construction. It was known in ancient times all over the East, in Greece, and in every part of Western Europe. It has flourished, however, most in mountainous countries. The peculiarity of this instrument consists, not in the pipe, which is simply an oboe, but in its accompaniment by a pair of *bourdons* or drones. In the Scottish Highland pipe these are monotonous—the tonic and fifth of its natural scale; but in the Calabrian pipe they are capable of some little variety. Another peculiarity of the instrument—that, indeed, from which it derives its name—is the bag, which is not generally a pair of bellows, but merely a receptacle for the breath of the player. Mr. Hullah then proceeded to speak of mediæval stringed instruments. The lyre appears on many monuments of the middle ages. In the first centuries of the Christian era everything associated with Paganism was avoided and repudiated by the Christians. The musical instruments of the old world, necessarily associated with Pagan worship, would be regarded by them with horror; and even music itself must have run some risk of rejection. But the same practical spirit which could adopt the Basilica as the model of the Christian Church, and, a little later, symbolise Christian truth by heathen fable, would not be long in turning to account an art said to have wrought such wonders in heathen times. The lyre, the embodiment and personification of ancient religion, poetry, and music, appears often in the illuminations and sculptures of the middle ages. Even as late as the thirteenth century its form was nearly the same as eighteen hundred years before. But, whatever the conquerors of the Old World may have learnt from it in other arts, in music they were competent to be rather teachers than learners, for they brought with them not merely instruments of the same principle and structure as those they found, but others unknown to the south of Europe, and, more than all, harmony, polyphony, music in parts, —an art and science, acquainted with which or not, the ancients never turned to account. Of the instruments brought in by the northmen the harp was the most important. Though probably known to the Romans, as it had been to the Greeks, it had never been adopted by either. How and whence the northmen got this instrument, is one of those historical or ethnological problems which will never be satisfactorily solved. It may have travelled from the East, across the north of Europe, or have suggested itself to such passionate lovers of music independently. Certain it is that the harp attained considerable perfection among our Anglo-Saxon, and even British, forefathers; and that both the instrument itself, and the art of performing upon it, were held in the highest honour among them. Moreover, harp is essentially a barbaric word. It appears, slightly varied, in Anglo-Saxon, Icelandic, Danish, and German. The Latinised form, *harpa*, first appears in a poem by Venantius Fortunatus, who wrote in the 6th century; it is not to be found in any ancient Latin writer. Schoolboys are taught to render *cithara* by harp, but there can no doubt that guitar is the closer translation. The mediæval harp was a portable instrument, small enough to rest on the player's knee without hiding his face; an important point when he was not merely a player, but a singer and an actor, often a poet, who would address himself as much to the eyes as to the ears of his audience. Moreover, the nomadic life of the minstrel would have rendered a cumbersome instrument all but useless to him.

The pole or bar is a characteristic of the Gothic harp, which essentially distinguishes it from the Assyrian or Egyptian. The necessity for it originated no doubt in the different material of the string in the two instruments. The Egyptian strings were of vegetable fibre, silk or gut; the Gothic generally of wire. Gut strings, though known in the middle ages, were not generally adopted till the seventeenth century. Mr. Hullah then directed attention to several drawings of mediæval harps, among them the earliest extant, which is from a MS. of the 9th century, formerly in the monastery of St. Blaise, in the Black Forest; another, a quadrangular harp, also of the 9th century, to which the name psaltery or psalterium is sometimes given. It is always found in the hand of David in MSS. between the 9th and 11th centuries, after which we find it replaced by the harp proper. He also exhibited drawings of psalteries of the triangular form in use from the 12th to the 16th century. The origin of this instrument was said to be eastern, and the name to be derived not from the Greek Ψαλλω, to sound, but from the Arabic *santir* or *pisantir*. A similar instrument is still in use in the east, but the strings are struck, not, as in mediæval Europe, plucked. Though not so picturesque as the many-stringed instruments, stopped instruments—those having finger-boards—are incomparably more important; not so much in themselves, as in their closer connection with the violin species, the use of which has so enormously influenced modern music. The finger-board, as was shown in the last lecture, is probably three thousand years old; but the most ancient western monuments of its existence are not older than the seventh century. It has been thought that the guitar species disappeared from Western Europe for some centuries, and was re-introduced with the Crusades. The mediæval *cythara* was not a guitar, but a harp. Stopped instruments are of two forms:—(1) with rounded pear-shaped backs, (2) with flat backs. The type of the first form is the *lute;* of the second, the guitar. The invention of the latter is generally attributed to the Arabians. Its Arabic name is *eoud*, which, by the prefixing of the article has become *laoudo* in Spanish, *leuto* or *liuto* in Italian, *luth* in French. Mr. Chappell, with characteristic patriotism, derives it from the Anglo-Saxon *hlud* or *lud*, *i.e.*, sounded. Once the most popular of domestic instruments, the lute has been superseded by its inferior relative, the guitar, which, in its turn, has greatly declined in general use and estimation. Mr. Hullah then called attention to two drawings of the *mandora* (whence the more familiar *mandolin*), a species of lute, and a small Moorish instrument of the same kind; and two so-called *Latin guitars*, one of which presented the nearest approach that an instrument could make to a violin without being one. It had sound-holes, sides indented, or *échancrés*, and apparently a bridge. In conclusion, he announced that he had been invited to conclude his course (which he had found impossible in the time prescribed) by giving two additional lectures, on the 29th inst. and the 6th May. In these he proposed to deal with the instruments of the violin species, and the combination of wind and stringed instruments in the modern orchestra.

Eighteenth Ordinary Meeting.

Wednesday, April 10th, 1867; Clifford Wigram, Esq., in the Chair.

The following candidates were proposed for election as members of the Society:—

Bailey, John, 163, Oldfield-road, Salford, Manchester.
Blacklock, William, J.P., Hopefield, Pendleton, Manchester.
Burton, Oliver, Tyldesley, near Manchester.
Henson, Henry H., Rutland-lodge, Watford, and 13, Parliament-street, S.W.
Sandbach, Wm. Robertson, 10, Prince's-gate, Hyde-park, S.W.

And as Honorary Corresponding Member,

Nobile, Signor Commendatore Gaetano, 14, Via Salata ai Ventaglieri, Naples.

The following candidates were balloted for, and duly elected members of the Society:—

Cassels, Andrew, Manchester.
Eadie, Robert, Blaydon-on-Tyne.
Mendel, Sam, Manchester.
Pagan, John T., J.P., Oak Lodge, Guildford.
Rydon, Horace James, Pyrland House, Highbury New-park, N.
Tolhurst, John, 152, Tooley-street, S.E.

The Secretary called attention to a new form of portfolio stand, or table, invented by Mr. McLauchlan. For description see page 333.

The Paper read was—

ON THE OPERATION OF THE CHAIN CABLES AND ANCHORS ACT, 1864.

By Robert Galloway, Esq., C.E.,

Chief Surveyor of Steam-ships, and Examiner of Engineers; and Inspector of Proving Establishments, Apparatus, and Machinery.

The two questions that I propose to discuss this evening are:—

1st. Is the test rendered compulsory by this Act a proper test? and,

2nd. Is it sound policy for the Government to institute any compulsory test?

The Chain Cables and Anchors Act, 1864, which is a fair specimen of that class of legislation that does at once too much and too little, is known as an Act for regulating "The Proving and Sale of Chain Cables and Anchors." It received the Royal assent on the 23rd June, 1864. It was passed, as stated in the preamble, on the grounds "that it is essential for the better security of lives and property afloat on sea-going ships to make provision for the proper testing of chain cables and anchors."

With the view of ensuring this "proper" test of chain cables and anchors, it provides: "That any corporation, public body, company, person or persons erecting any proving establishment, apparatus, and machinery suitable for testing chain cables and anchors, may be licensed by the Board of Trade." The Board of Trade have power to appoint an inspector of proving establishments, and "may" license any establishment which that inspector certifies as being suitable for testing chain cables and anchors under the Act. These licenses are renewed (after inspection) annually.

Here we have all that is required of the Government and their inspector. It is well that we should understand this point at once and thoroughly. The inspector is required to inspect the establishment, apparatus, and machinery. If and when he is satisfied that it is suitable for testing chain cables and anchors, under the Act, he gives a certificate to that effect, and has done with it—unless and until the owner wants his inspection again next year. The inspector merely inspects for sufficiency once a year, and his duties and powers end. The duty of the Board of Trade is simple enough. It is defined in a very few sections. It has power to appoint an inspector; to charge fees for licenses; to grant and renew licenses on receiving certificates from the inspector; to remunerate the inspector; to approve of proof marks; to fix a scale of charges for proving—and that is all. In short, as far as the Government are concerned, it has had to settle the scale of fees; to approve of the proof marks, and to determine the conditions necessary to be complied with by proprietors of proving establishments to satisfy the Inspector that a machine can exert the strain required by the Act. Having done this the Government are not required, nor are they authorised or empowered, to do anything more than issue certificates annually on receiving reports from the Inspector.

The next thing for us this evening is to understand the duty imposed on the tester. It is his duty to see that chain cables and anchors which may be brought to him for the purpose are "tested" in their proper turn, and if they stand the test then he is required to stamp every five fathoms of chain and every anchor to denote that they have been "proved." The tester has a right to certain fees for testing, and has power to detain the property until those fees are paid. He is also required by the Act to give a certificate of proof, free of charge, within one month after a cable has been tested.

Any persons improperly stamping, or assisting in stamping a chain cable, &c., or counterfeiting proof marks, are liable to be punished, if it can be proved that they have done so for the purpose of, or with the intention of, passing it as a chain cable, tested and stamped under the Act; and any person giving a certificate of proof, under the Act, for a cable or anchor that he knows has not been proved is also liable.

The chances of conviction, under this clause, depend on proving the "intention" of the fraudulent marker, the "knowledge" of the fraudulent seller, and the "knowledge" of the forger or issuer of certificates for untested chains and anchors, and on proof being produced that the chain is supplied to be used as part of the equipment of any ship or vessel. As regards the seller and dealer in anchors and cables, the Act provides that it shall not be lawful for any maker of, or dealer in, chain cables or anchors to sell or contract to sell "for the use of any ship or vessel" any chain cable whatever, or any anchor exceeding in weight one hundred and sixty-eight pounds, unless they have been tested and stamped under the provisions of the Act; and any person selling a cable, &c., fraudulently marked, and knowing it to be so wrongfully stamped, is to be punished. So that to get a conviction it is necessary to prove first that the anchor or cable is supplied for the use of a certain ship or vessel, and secondly, the knowledge of the fraudulent seller.

The last clause, and one which the opponents of the Bill look on as the best clause of all, provides that the Act shall not remain in force beyond the 1st February, 1872.

To sum up, the Act requires all cables, and all but very small anchors, to be tested at a machine licensed by the Board of Trade. That machine may be the property of an independent corporation, or of a manufacturer. A tester may test his own cables and anchors, on his own works at machinery of his own, and by his own workmen, and then himself give a statutory certificate of public proof. The Act provides for an annual inspection, and an annual licensing of machines, and imposes penalties on persons not complying with its provisions. Is not this at once too much and too little?

We have seen what the Act does provide for, and we will now see what it does not provide for, or, if it provides for, does not secure. The Act does not empower any person or department to see that its provisions are complied with. The Board of Trade have no power or authority whatever to prosecute for offences under the Act, and have no funds at their disposal out of which to institute prosecutions, and the manufacturers, and buyers, and sellers of chain cables will not prosecute. It of course rests with persons aggrieved to take steps for themselves, but they have not done so yet. No provision is made for punishing any person who tampers with a proving machine after it is licensed by the Board of Trade. The Inspector gives his certificate when he is satisfied that a machine can do a certain amount of work if fairly and honestly used, but any one can alter that machine after it is licensed so as to make it exert a lighter strain than intended. It should therefore be unmistakably understood that at present the Board of Trade license is only a guarantee that the machine can do a certain amount of work, but is no guarantee at all that it will be required to do so, or that cables tested at it will be tested to the strain required by the Act, or will be tested to any given strain.

The Act does not insure an independent test. However honest a man may be, he ought not to be allowed to test his own articles for certificates of public proof; and, without in the slightest degree impugning the honesty and integrity of any person, one may fairly say that so long as a maker, be he ever so honest, is allowed to test his own chains for a statutory certificate of proof, the Act is not satisfactory.

But assuming, as is without doubt the case, that every establishment licensed under the Act is honestly worked, whether public or private, whether under separate management, as at Birkenhead, or at Low Walker, or whether in the premises of, and under the sole control, guidance, and management of, the manufacturer himself, the question still remains whether the test required by the Act is itself the proper test. We must now consider what that test really consists of, and for this we must refer to the Act,—Section 7. That section provides that—"Every tester shall, with all reasonable despatch, subject every chain cable or anchor, that shall be brought to the proving establishment of such tester for the purpose of being proved, and (unless the parties interested may otherwise agree) in the order in which such chain cables and anchors respectively shall be so brought, to the same tensile strain as that to which chain cables and anchors respectively of similar size, weight, or description are or shall be subjected before being received for the use of Her Majesty's naval service." From this it will be seen that the only test required by statute is a "tensile strain," or, in other words, a direct pull of a certain amount, varying with the size of the chain.

Having seen that the only test is a direct "tensile strain," we must next notice that that "tensile strain" is not regulated by the quality of the iron of which the chains are made, but solely by its thickness. In other words, the test as it is now applied, is applied on the false assumption that strength and thickness are convertible terms, or in other words, that iron of a uniformly good and high quality is used in the manufacture of all cables.

Authorities on the subject of the strength of iron and iron work lay it down as a rule that the proof strength and working stress should bear a certain fixed proportion to, the ultimate strength and to each other; and that these proportions can never be departed from without risk. Now, assuming (without admitting or denying) that the proof or Admiralty test legalised by the Act we are now considering, is, or was, determined by, and bore a fair and proper proportion to, the ultimate strength of the material used at the time for cables, and that that test was the proper test for the particular quality of iron of which chains were made when the proof was established, does it follow that it is the proper test now?—and the best for all sorts of iron, whatever their quality? Does it not rather show that it is only a proper proof for the iron of the quality for which it was established? And is it right now to apply this proof indiscriminately to all sorts of iron, bad or good?

To make my position clearer. We know that when a minimum scale, or quality, or size, or proof is fixed by the Legislature, that minimum very soon becomes the practical maximum; that when a standard of minimum strength or thickness is once fixed it is worked up to, and so long as that minimum strength is arrived at, or that thickness attained, the Act is complied with, and the article or building passes muster, and gets a certificate, without reference to other and perhaps more important considerations. Now it so happens that iron manufacturers and chain cable makers are the cleverest people in the world for producing an article that will stand a certain test. It is no part of the business of the manufacturer of cables to ascertain that the ultimate strength should be so much more than the proof strength, and the working stress so much less. All he has to do is to comply with the provisions of the Act and to take care that his cables will stand the proof, and he can do this to a nicety.

Professor Rankine, in his work on applied mechanics, shows:—That for wrought iron boilers the proof strength should be half of the ultimate strength, and the working stress one-eighth of the ultimate strength, or one-fourth of the proof strength. As regards wrought iron, for steady loads, that the proof strength should be half of the ultimate strength, and the working stress should be one-third of the ultimate strength. We here see that proof strains should bear a certain proportion to the ultimate strength and working stress of the material proved, and as the Chain Cables Act does not provide for this, such a test in the case of chain cables is fundamentally and radically wrong. The manufacturer may make a chain that will stand the proof, but will break at 10 per cent. above it. In this case the ultimate strength is only 10 per cent. more than the proof, instead of being, as it ought to be, far more. In such a case the iron is tried beyond the limits of elasticity and the cable is ruined, and it is rendered but a poor weak thing, ready to part on any sudden stress or strain being applied.

The answer then to my first question, whether the test required by the Act is a proper test, is that no test can be a proper test that is not regulated by the ultimate strength of the material tested, and that as the test required by this Act is not so regulated, it is not a proper test.

The second question for consideration is, should there be a compulsory test?

The result of the working of the present Act is stated, in papers presented to Parliament, as follows:—

Messrs. Lamport and Holt to the Secretary of the Board of Trade.

Liverpool, 11th February, 1867.

Sir,—We venture to take the liberty of calling your attention to the unreliable character of certificates of the testing of chains and anchors given under the provisions of the Act of Parliament. Confining ourselves to our own experience, and beginning with the month of November, 1865, no less than seven cases have occurred of the breaking of new and duly certified chain cables in use on board steam vessels of which we are owners. In all these cases the certificates were such as would comply with the requirements of the Board of Trade surveyors. The latest of these cases, that of the screw steamer "Donati," which happened in the river Mersey on the 8th inst., affords means for minute inquiry into the circumstances, in the event of your considering the subject sufficiently important for such an investigation. This steamer was supplied with two cables, 150 fathoms each, of $1\frac{9}{16}$ inch chain. A copy of the testing certificate is enclosed herein. Both cables broke successively, almost immediately after the anchors were dropped, and while there was but little strain upon them. One of the cables had never been used before; the other had been used only once before. We may be forgiven for adding that so many cases of broken chains had not occurred to us in our previous twenty years' experience as shipowners.—We are, &c.,

(Signed) Lamport and Holt.

J. J. Lawrie, Esq., to the Secretary of the Board of Trade.

Glasgow, 16th March, 1867.

Sir,—As it is probable that measures will shortly be adopted to amend the Merchant Shipping Act, 1854, I am anxious to mention to you the following matter of an analogous kind, and of great interest to the shipping interest. Since the Chain Cables and Anchors Act, 1864, came into operation, by which the chains and anchors of ships must be subjected to certain proof strains, defined in that Act, before they can be used on board ships, the number of accidents caused by the breaking of the cables has been very much greater than before the passing of that Act. I am certain that I understate the facts when I say that for one case before the passing of the Act in which the cables were broken in the riding of the ships, there have been ten such accidents since the Act came into operation. The inference that has been drawn from these accidents is, that the cables are heart-broken in the process of being proved, and that the Act either requires too great a proof strain, or is defective in not providing that the iron of which the cables are made shall be of a quality that will sustain, without injury, the specified proof strain. This feeling is becoming so strong that for the safety of the ship it is now considered very undesirable and unwise to subject the rigging chains to a proof strain so great as that specified in the Act for cables. It is certainly most important that cables and anchors, and indeed all the chain used on board ships should be proved to be well made and of good iron, but for that purpose other means, I humbly submit, should be employed than those specified in the Act.—I am, &c.,

(Signed) J. J. Lawrie.

Now, without endorsing these statements to the fullest extent, there is, I think, abundant proof that the test imposed by the Act has been the means of introducing inferior iron more generally into use than formerly. I do not say that this would be the result of a proper test, but I think that it is the result of the present test. It may fairly be admitted and assumed that a proper test and a proper examination are necessary, and that the aim and object of the Government should be to ensure such a test; and it cannot be denied that no cable or anchor ought to be used on board a ship, or insured by underwriters, unless and until it has been properly tested, examined, and certified. We cannot give Mr. Laird and the promoters of the Bill too much credit for their philanthropic designs in trying to get a proper test. Here we shall all agree, but the question is—how should that proper test and examination be secured? Here we are likely to find a difference of opinion. There are some persons who would wish the existing Acts to be made more stringent, to give the Government further powers of supervision and inspection, and powers to prosecute and recover penalties. There are even some who would go so far as to make it felony to sell an untested chain. On the other hand, there are those who are for doing away with the compulsory test entirely, and for giving buyers and users an easy and effectual remedy against sellers of bad chains.

To speak broadly, there are two opposing parties:—the one wish the Government to do all the work of supervision, and to take all the responsibility; and the other wish the Government to take their proper place as chief policemen, and to leave the responsibility where it ought to be left—on the shoulders of the persons most interested, viz., the buyers, users, and sellers of cables, and the public. Those of the former school are a very numerous class, and those of the latter school include men of careful habits of thought.

Our object to-night is to raise discussion; I propose, therefore, to take the side of the opponents of undue interference on the part of the Government. In a hall like this, where men of intellect, and capable of reasoning "most do congregate," it is well to raise a direct issue, and to have an argument. It matters little whether the person raising it is right or wrong. The great point is to raise an issue, and to invite discussion, so that, through that, we may arrive at truth. I then—with this object in view, as well as from firm conviction—will say, that a compulsory test is bad and vicious in principle, and should not exist; and I call on any person opposed to this view to express his opinion openly, and to controvert it.

After raising this direct issue, I have but little to do before sitting down and listening to the opinions of those gentlemen who may favour us with a statement of their convictions and conclusions, and of the grounds or process on and through which they have arrived at those convictions and those conclusions. I have only now to say that I think that public security would be ensured, and the objects of the promoters of the Act would be gained, if public corporations alone were allowed to test chain cables for certificates of public proof. I would, however, not have that proof compulsory, but would have it more effectual than compulsory proof. I would make it to the interests of all parties concerned to use good iron and good workmanship; and I would, as Mr. Gray stated, in his paper, read in this room in February,[*] 1866, and, as I believe, had already been suggested by the Board of Trade, do this simply by authorising the Board of Trade to licence public machines, and regulate the nature and extent of the test, and then leave it for the buyer to have his chain tested at a public machine, at the expense of the seller. We should have then but few bad chains; and it would be to the interest of all persons to make, provide, sell, underwrite, and use good chains without the assistance of any compulsory legislation at all.

Unless something is speedily done, we shall, according to opinions pretty frequently expressed, be placing our merchant ships in a far more dangerous position than they were before the passing of the Act.

Gentlemen, I thank you for the attention you have given me, and call on you to express your opinions in a plain and unhesitating manner.

DISCUSSION.

The Earl of **Caithness** said he looked upon the question brought before them by Mr. Galloway as one of vital importance to the country at large, and, indeed, to every country in any way interested in maritime affairs. He did not like to say he was positively against it, but he certainly was not much in favour of the compulsory testing of chain cables. At the same time he thought it was very important that a chain cable should be tested, because, as every link was welded, it seemed necessary that there should be some means of ascertaining whether every weld was perfectly good; but to test a cable to anything near its breaking strain was, in his opinion, a great mistake, because then the ship had nothing left to do but to break it, and when a ship was lying to in bad weather, they all knew that the strain was not of the most gentle or even character. The cable would not stand such a strain as that when it had been half broken previously, all the elasticity of the iron being destroyed, the fibres being torn, and, he might almost say, disintegrated. He was afraid, also, that the best material was not usually put into chain cables at the present time. John Bull liked to put a shilling into his pocket when he could, as well as anybody else, and he did not blame him for doing so, but when it was a question of life and death, and of such a vast amount of property, as was involved in the safety of a ship, the very best material ought to be used. He would urge upon any one who had anything to do with shipping not to have his cables tested to anything like the breaking strain. Not being himself an engineer, however, he offered his opinion with some diffidence.

Mr. **Betterley** said that he should like, having been connected with the making of chains and anchors for the best part of his life, and having made the largest anchor in the world for the Great Eastern, to give the result of his experience. The first question was, whether the testing of chain cables should be compulsory or not, and, as far as that was concerned, if there were such a thing as a proper test he would readily agree to it; but the fact was, that all the Act had effected was not a government proof of the chain cables themselves, but only of the machinery for testing them. Some of these machines were examined to such a degree of nicety that they would almost prove a chronometer, and the expense the country was put to in consequence was enormous, whereas he (Mr. Betterley) could put up machinery for £150 which would test any chain cable, because nothing was wanted but a hydraulic press. Then came the question, who was to examine the chain and give a certificate respecting it. It was true that a government inspector had passed the machinery, but his duty did not extend to the examining of cables. The person who did this had no certificate of competency; he might be an engineer, a chain maker, or, indeed, anything else; anyone who was well recommended might get such an appointment, which was worth perhaps £3 per week. Some firms paid as much as £50 a week for proving, and it would be well worth their while to pay an additional £5 a week to get their cables passed. The present compulsory test really involved an expense of about £1 per ton, for there was not only the expense at the proof-house, but the carriage to and fro, and this amount was really so much taken from the value of the iron which was put into the cable, so that in fact people got worse cables for their money. Cables had been proved and certified in Staffordshire, and when they went down to Liverpool they had been found to break. The certificate said that the cable had been proved to a certain point, and, as Lord Caithness had well observed, the ship had often nothing left to do but to break it. But not only did this law add £1 a ton to the cost of the cable, but it led to the manufacturers getting a Government certificate for their "proof-house," whether or not it was rightly used afterwards. This was just like building a stable, and getting an architect to certify that it was properly erected, but having no certificate as to the soundness of the horse it contained. As to the welding of the links, they did not require any Government inspector for that. He maintained that the machinery for trying the men's work, whether it were sound or not, was as much a portion of the machinery of the shop as anything else in it. It was the business of the master to ascertain whether the work was sound, but if they were to go further, and seek to ascertain if the iron were good, they must pull the chain to pieces, and if that kind of proof were required all the cables would be destroyed. He was in favour of the cables being tested by some person thoroughly competent to examine them, who should be allowed to take out two or three links wherever he thought proper, and strain them until they broke. Then he could give a certificate that the iron in such a cable stood such a test, and if it did not stand 50 per cent. more than the present proof he should not give a certificate at all. He thought that by such means they would get good cables. All this was a matter of indifference to some classes of shipowners; in fact, there might be said to be a premium offered to them against good cables, because, in many cases, they could recover more from the underwriters than the value of the vessel. There were many cleverer swindlers than the man Houldsworth, who bored a hole in his vessel; many a clever scoundrel would prefer to buy a cheap cable, that did the business quite as well as the auger. Therefore, it was a serious question for the underwriters to consider, whether they would insure chain cables at all, so that if a ship broke her anchor or chain they would not hold themselves liable, or, at least, would reserve the right to deduct so much from the insurance. That would make it a necessity with the shipowner to provide good ground tackle. The whole value of a ship, perhaps half a million, often hung on a chain with a thousand links, and the weakness of one would destroy the whole. It was the interest of the underwriter to look after these things, and the question then arose whether the Government should step in and protect the underwriter, or whether the underwriter should protect himself.

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[*] See *Journal*, Vol. XIV., p. 232.

Mr. T. M. Gladstone said the subject before them had long been familiar to his mind, and he was one of those who had taken a part in bringing about the present Act. The question now raised, whether the test provided by that Act was a proper one, he would himself answer in the affirmative. This kind of test had long been used in the Admiralty dockyards, and when it was found that the cables supplied to the Royal navy were fifty per cent. better, at the very least, than those generally used in the merchant service, he thought it might be considered a fair argument that a compulsory test, whereby the same high quality should be secured in chain cables generally, would be a step in the right direction. This test indicated something like two-thirds, or less, of the strength which might be expected from good material, so that there was sufficient margin left, provided that the material was really good. The test applied rather to the manufacture—to the weld, which was the weakest part—than to the material itself, and was thus efficient when good material was used; but still manufacturers could contrive to make an article which would just pass the test and nothing more, by employing inferior iron. Still he maintained that, although this might be the case, experience under the Act had shown that upon the whole we now got better cables than before the Act was passed; for, before that test was enjoined, seven-eighths of the ordinary chains would not stand the test at all by 15 to 20 or 25 per cent. He perfectly agreed, however, with the suggestion of Mr. Betterley, as to the taking out two or three links at the choice of the inspector and subjecting them to an additional test, which if they did not stand, the cable should be rejected. Some test should be used quite beyond that which related to the manufacture. No chain should be allowed to be used which would not stand at any part selected from 25 to 50 per cent. additional test. An allusion was made in the paper to the striking difference in the testing of boilers. If boilers were made as chain cables were, merely to be equal to the proof test, there would be no security for the quality of the material, and the test would be very imperfect, and therefore he believed the conditions imposed were that the plates themselves should stand a certain pressure to the square inch beyond that to which the whole boiler itself was subjected. Why could not the same principle be adopted with chain cables? A person who understood the manufacture of iron would, without testing a link at all, by simply breaking it to pieces under a hammer, know from the nature of the fracture, whether it was made of common, inferior, or good iron. That would be a good way to test the material used. The next question was that of general examination, and this could not be too perfectly performed. The Act of Mr. Laird, however well intentioned, was nevertheless defective; tending in a great degree to produce the result given in the letters which had been read. Still he was of opinion that there should be a compulsory test, because if it were left to the manufacturer there would be little or no test at all. Even now thousands of cables had gone out with certificates that never were near a testing machine at all. Then the next question was, was it sound policy for the government to provide a proper test? He most distinctly considered that it was. It had been left to private parties, and they had altogether failed in providing what was required. Lloyd's Committee, for which he had the honour for some years to be engineer, took great pains, before the passing of this Act, to establish public tests; and at first, before the manufacturer contrived to reduce the quality of the material, there was a great improvement in the chains produced; but, after a time, it was found that there were no means by which the quality of iron could be properly tested. He thought the Act could be so amended as to secure that protection which the public had a right to demand. In the proof at the dockyards, the quality of the material was examined beforehand, and the want of this additional precaution was the worst defect in the arrangement under Mr. Laird's Act. He had formed these opinions from long experience in this matter, and he hoped that some suggestions would be made and adopted, which would secure the desired object.

Mr. G. B. Galloway said he perfectly coincided with the views of the preceding speaker. It seemed a great anomaly that an inspector was appointed only to test the machine. He quite agreed that this was an underwriter's question, but it was a national question also. He did not think it would be sufficient to take out two or three links in order to test the quality of the cable, because the blacking and swaging covered up little defects in the welding which might pass unnoticed if the whole chain were not tested. He was of opinion that the importance of the question demanded a compulsory test, that a proper test could be devised, and that there never would be a proper test, except under Government inspection.

Mr. Beasley (of Liverpool) said although he thought the present Act did not now work satisfactorily, he was yet of opinion that it was quite capable of amendment. Several of the previous speakers had suggested the remedies, and he believed the noble lord who opened the discussion was right in saying that a great deal of the present breaking of cables resulted from the overstraining to which they had been subjected. Within the last twelve months he had had the cables of a new ship tested at the Birkenhead works, where there was admitted to be the best testing machine in the country. The ship he alluded to sailed in May last for Calcutta. She first of all parted one chain in Calcutta, and then she came back and anchored in the Downs, and there she parted the second. He had a piece of the broken link in his hand, and, as Mr. Gladstone had said that he could tell by looking at the fracture what was the quality of the iron, perhaps he would kindly say. The explanation of the cable-manufacturer was, that as shipowners, when they had a contract, sent round for the lowest tenders, the manufacturers went in for the lowest quality of iron that would bear the strain. He, in his simplicity, had always thought that when he had a cable which had passed the Admiralty test it would be capable of bearing any strain which was likely to come upon it. The present Act seemed, therefore, a mere delusion, especially as it now appeared that the Government did not themselves certify to the cables, but only to the machine, which he believed was contray to the impression of most underwriters. Here were two cables which had gone through the very best machine, and they both parted the very first voyage.

Mr. T. M. Gladstone asked whether the cable broke in the iron or in the weld.

Mr. Beasley said it had gone both in the iron and in the weld. Mr. Beasley then read a letter which he had received from the Inspector at the Birkenhead works, which, after describing the way in which the writer identified the cables, stated that one of the cables broke four times during the test, and had eleven other defective links, and the other one broke once, and had one other defective link; both were repaired on the premises, and were then re-tested. The following were the strains at which the links parted, which went to show that what had been stated, as to manufacturers calculating to a nicety, was correct:—The first link broke at 58 tons 15 cwt. in the iron (the admiralty-test being 59, so that it came within 5 cwt. of it); the next broke at 58 tons 14 cwt. in the iron; the next at 57 tons 15 cwt. in the iron; the next at 58 tons 5 cwt. in the weld; so that only one of the four faults was in the weld. The second cable broke at the exact strain of 59 tons. He thought the Act required a great deal of amendment, but he still was of opinion that compulsory testing should be continued.

Mr. T. M. Gladstone said the broken link which had been handed to him had been about half welded. It was perfectly clear that iron of that quality, if thoroughly welded, would have left a considerable margin of strength above the test. There were two conditions of a defective weld. A link might be half welded, or it might be over-heated, and the quality of the iron thus destroyed at a particular part, although the general character of the material might be good. The only guard they could have against these evils was an examination by an independent person. There should be a full examination of the chain, and and also of the material before it was used. Those were the only securities they could have, for it was impossible, under any law, to obtain positive certainty in this matter, in the same way as they could arrive at the absolute purity of gold or silver.

Mr. Jones asked if it were ever noticed that a change in the form of the cable resulted from the testing of it, and if this were not followed by a diminution of strength.

Mr. Betterley said his experience showed that if a chain were tested beyond a certain extent, if the iron were good it was drawn out, and it became smaller than it was before. If it were struck with a hammer while under this strain, it would go to pieces.

Mr. Jones asked if it were possible then to subject a chain to a proper test without disturbing its form.

Mr. Betterley did not think it was possible to apply a test of any value without so doing. They might try it to a certain extent in order to try the workmanship, but the moment you began to try the character of the iron, that moment you began injuring it. He was therefore an advocate for a moderate test to try the workmanship, with liberty to take out two or three links at any part in order to try the quality.

Mr. Jones doubted whether there would not even then be a risk of some of the links being made of inferior material. He knew this was the case in gold chains; it was not safe to assay only one or two links.

The Chairman said his own opinion on that subject, both as a shipbuilder and shipowner, was decidedly opposed to the compulsory testing of anchors and cables. Firstly, on the principle that you could not make people moral by Act of Parliament, and, secondly, because he did not see why anchors and chains were to be the sole portion of a ship's outfit which was to be tested. They were important articles, no doubt, and occasionally the safety of a ship and of everybody on board depended on their strength, but why were they to be tested and not the rigging, masts, yards, and sails, on which that safety much more often depended. Whenever a ship was in deep water, and exposed to the full fury of the winds and waves, perhaps in a hurricane, her safety depended on her inherent qualities as a good ship, on the strength of her masts and rigging, and, more especially, on the strength of the main post of the rudder. He thought it was very unwise to legislate on one portion of a ship's outfit and not on the rest. His own experience of anchors and chains was that there was not the least difficulty in getting sound and good ones by any shipowner who would pay a good price. If they went to the very lowest market and paid 10s. to 10s. 6d. per cwt., they could not expect the same article as if they had paid 12s. When a man's name became known as an owner who provided his ships properly, the underwriters would have confidence in him, and would often be willing to underwrite everything on board at five per cent. less than they would in other cases, and in consequence he would perhaps be able to charge 2s. 6d. a ton larger freight. One practical result of the introduction of the Admiralty test was this:—They used to have what were known as Admiralty chains and merchant chains, and the merchant chains were required by the Lloyds Society of Underwriters to stand a certain test which was much lower than what was known as the Admiralty test. If shipowners were willing to have their chains made of a superior quality, so as to stand the Admiralty test, they were allowed to use smaller chains than if they only stood the merchant test. The practical working of the present Act was that smaller chains were used, so that although they might be of superior quality, they would not stand a greater strain than they used to do when they were larger but of slightly inferior quality. In his own mind he was convinced that the piecemeal legislation, which referred to only one portion of the ship's outfit, was objectionable, whilst it left everything else to the discretion of the owner. He begged to move a cordial vote of thanks to Mr. Galloway for the important paper he had read.

Mr. Galloway begged to thank the meeting for the patience with which they had listened to his paper, and also those gentlemen who had been kind enough to offer the remarks which he had been very much pleased to listen to. It seemed to be the general opinion that the law required amendment, and the only question was what the amendment should be. That must be very well and carefully considered, and he hoped that with the assistance of shipowners and others interested, a proper decision would be arrived at.

PARIS UNIVERSAL EXHIBITION.

Great advances have been made since the opening day, and those who desire to study the whole exhibition cannot do better than commence at once, before the public begins to throng the galleries; but this period will not be a long one, for now that the admission is only one franc, the stream will soon become large and constant.

The picture and sculpture galleries are more nearly complete than any other portion; the works were all hung, and the floor covered on the opening day, and on the day following the labels and numbers were being placed on the frames. In the French and other sections the walls are all, with very few exceptions, covered, and the same process of labelling is now going on there. The collection is an extremely fine one, especially as regards France, Russia, Germany, and England; the special galleries of Belgium and Holland in the park were not opened two days ago. The total number of works of art is very large, perhaps five thousand in all, without including the contents of the retrospective portion.

As regards the latter department, the French and Russian sections are the most forward; in the former there is a small but curious collection of ancient arms, bronzes, iron work, carvings in ivory and wood, all in perfect order. In the French section the cases are all ready, and are being rapidly filled; the show of enamels, carvings, faïence, iron work, and furniture is highly interesting, and promises to be very fine.

The English section of this gallery has been delayed by the fitting of a double-iron door, to prevent all chance of accident by fire; but, from what we have already seen of the promptitude exhibited by the commission, our retrospective gallery will very soon be complete.

With rare exceptions, the weather during the past week has been fine, and the effect on the park and garden is astonishing; the paths are now in fair order, the shrubs are budding forth, and the Paris gardener, from his immense stores, can fill the flower-beds at any moment as soon as the cold winds warrant his doing so. When the trees and shrubs are covered with foliage, the objection, somewhat captiously made, to the heterogeneous appearance of the park, will be almost entirely removed. But without any qualification or alteration, the park presents a mass of most interesting novelties, teeming with instruction for those who are inclined to study.

There is in the park a model crèche, where infants may be left by mothers visiting the exhibition; those who have the welfare of the working classes at heart, and especially those who reside in manufacturing districts, will do well to examine this simple but useful philanthropic establishment.

Men of business will be glad to know that the post and telegraph offices in the park are now in full operation; the regulations of the former are the same as at the principal district offices in the city; that is to say, letters can be posted till a quarter to six, or with additional stamps of 20 cents, or 40 cents, till six, or a quarter past six. As regards telegrams, notice is given that the country and class, or section, must be added to the name of the exhibitor, or his agent, to insure delivery.

The special railway laid down for the purposes of the Exhibition is opened to the public, and promises to answer its purpose admirably. As already stated, it connects the Exhibition with the circular line around Paris, as well as with the terminus of the Western Railway, which is situated in the English quarter, not far from the church of the Madeleine. The trains at present run to and from the latter point every hour, and the journey occupies half an hour. The carriages are all of the second class, and the fare 50c. for the whole distance.

The Corps Legislatif has adopted the proposed law for the security of inventions and improvements; all those who exhibit anything which they desire to protect, whether mechanical or artistic, must comply with the regulations and forms of the patent or registration office in Paris within the current month, but no fees are charged by the Government.

The International Juries have commenced their labours, and, considering the time allowed, and the great extent of the collection, exhibitors should take care that all necessary facilities and information should be afforded to the juries, whose time is exceedingly precious; the British Commission has appointed a delegate in each class, to act as intermediate between itself and the juries, and thus protect the interests of British exhibitors as far as possible, but it depends upon the exhibitor to furnish the necessary information, and to see that his name, number, &c., are properly given. It may be well to mention that the delegate has nothing whatever to do with the appreciation of the objects; this rests entirely with the juries.

M. Walowski, the learned professor, member of the Institute of France, drew the attention of the students of the Conservatoire des Arts et Metiers, to the Exhibition, the other day, by a lecture on the History of Industrial Exhibitions. M. Levasseur, professor of history at the Lycée Napoléon, has also delivered a lecture on the same subject at the Sorbonne.

POSITION OF INVENTORS AT THE PARIS EXHIBITION.

M. de Fontainemoreau writes as follows:—

In accordance with the intention of the French Government, as intimated by M. de Forçade, Minister of Agriculture, Commerce, and Public Works in France, in his letter to my Paris correspondent, of which a translation was recently inserted in the *Journal* (p. 251), a bill was passed into law, on the 27th March, granting a "Certificat Descriptif," or provisional protection to exhibitors, non-patented in France, upon complying with the requirements enacted by such law, of which I beg to submit a translation for the information of your readers:—

Law of the 27th March, 1867, *Protecting until the* 1*st April,* 1868, *Industrial Inventions and Manufacturing Designs admitted to the Universal Exhibition of* 1867.

Clause 1.—Any French or foreign subject being the author of a discovery or invention susceptible of being patented under the law of the 5th July, 1844, or of a manufacturing design, which may be registered pursuant to the law of the 18th March, 1806, or his representatives may, if admitted to the Universal Exhibition, obtain from the Imperial Commission of the Exhibition a certificate, descriptive of the article deposited. The application for this certificate must be made within one month, at latest, from the opening of the Exhibition.

Clause 2.—This certificate secures to the person who obtains it the same rights as those conferred by a Patent of Invention, dating from the day of admission by the French or foreign authority appointed to that department, until the 1st April, 1868, even should that admission be anterior to the promulgation of the present law, and without prejudice to the patent which the exhibitor may take, or of the registration he may effect before the expiration of that term.

Clause 3.—The application for the certificate must be accompanied by a correct description of the article to be protected, and, if required, by a plan or drawing. These applications, together with the decisions taken by the Imperial Commission, shall be entered in a special register, which shall be ultimately lodged at the Ministry of Agriculture, Commerce, and Public Works. The issue of this certificate shall be gratuitous.

NEW FORM OF PORTFOLIO STAND.

The handling of large portfolios and books is often a matter of some difficulty. A novel form of portfolio stand has been contrived by Mr. F. H. McLauchlan, and is manufactured by Messrs. D. J. McLauchlan and Son, of Castle-court, Berners-street. It is so arranged that when closed it occupies less space than the usual kind of portfolio stand, and in opening the legs expand, giving greater stability. As the weight of the portfolio is partly balanced, the motion is very easy, and it will remain at any angle, or may be extended flat, in which position it can be fixed and used as a table. In one form the flaps are made solid for this purpose, and in another they enclose the contents as in a box. Various modifications enable it to be used for special purposes—thus, when intended as a stand for a large ledger, or similar book, it is made to open with the top inclined conveniently for writing.

Fine Arts.

Memorial to Thomas Stothard.—It is proposed that a bust be executed by Mr. Weekes of the late Thomas Stothard, and placed in the National Gallery, by the side of similar memorials to deceased British artists. It is said that ample materials exist for an authentic likeness in the pictures by Harlowe and Green, the bust by Baily, and the cast by Chantrey. Stothard's "graceful and classical designs," in illustration of standard authors, it has been thought by numerous admirers, entitle the artist to the memorial now proposed. Several subscriptions have been already received. Mr. William Smith, of 20, Upper Southwick-street, Cambridge-square, acts as hon. treasurer and secretary,

Colonies.

Local Exhibition at British Guiana.—A local exhibition of colonial products was held here early in the year, under the auspices of the Royal Agricultural and Commercial Society. It was formally opened by his Excellency the Lieutenant-Governor, who was welcomed by the president of the Royal Agricultural and Commercial Society, the president elect, the mayor of Georgetown, and several of the directors. The president read an address to the following effect:—After thanking his excellency for having consented to preside, reference was made to the exhibitions held in January, 1855, and August, 1861, and it was stated that the present exhibition, like the former, was not merely of a local character, for the purpose of promoting among all classes of the community competition in the development of the industrial resources of the colony, but was subsidiary to the representation of British Guiana at the Paris Exhibition of 1867. In addition to the advantages of the undertaking in its industrial, commercial, and scientific points of view, the meeting, for a common purpose, fo a large number of persons representing those of the different classes who were anxious to promote the interests of the country, must foster kindly feelings, and a sense of the benefits to be mutually derived from co-operation. Brief mention may be made of some of the most interest-objects in the rooms. Samples of vacuum pan and muscovado sugars of various qualities,—some of the former too white and good to admit of its being exported—and of white and coloured rum and molasses were exhibited and admired. There were some excellent specimens of different kinds of cotton, and an important display of starches, fibres, oils, medicinal plants and other valuable objects. There were cases of rare and curious birds. The collection of insects by Dr. Whitlock was excellent and well-arranged, the estimated value being £100. There were some fine fruits, flowers, and vegetables exhibited, and many and various articles remarkable for beauty, rarity or curious workmanship. A collection by Mr. Firth, sub-agent of immigration, of works having reference to the colony, its affairs, natural history or products, excited much interest. There were no less than 194 volumes and about 240 pamphlets, some of them of great antiquity. An extra prize of 50 dols. was awarded to Mr. Firth. The exhibition was kept open for six days. On the first day the charge for admission was half-a-crown, but on the other days only a shilling, and a sum somewhat exceeding £100 was realised. There is a disposition to have another local exhibition at the close of the present year. The feeling is gaining ground that to have one annually instead of quinquennially would do much good. Great praise is due to Dr. Whitlock, the honorary secretary to the Committee of Correspondence, for the skill he displayed, and the interest which he took in everything connected with the exhibition.

Publications Issued.

The Laboratory; a Weekly Record of Scientific Research. (*Firth*, Cannon-street).—The first number of this new magazine appeared on the 6th April. The editor says, " in putting forth this, the first number of *The Laboratory*, we are actuated by the conviction that the want this journal is intended to supply has hitherto been inadequately met. We believe that the large and important class which includes the cultivators and students of experimental science has not, up to the present moment, been presented with a journal fully reflecting that which is being accomplished in the public and private laboratories of the United Kingdom. When a train of subtle scientific thought and labour has culminated in a great result, the ordinary journals take note of the fact; but the minor and tentative labours that contribute to rear the great edifice are left unnoticed till the work is completed. It is our intention to record these early efforts—these original investigations—whilst they are being made. We shall not wait until the theory be perfected—until the history be completed; we shall give the elements that are being used in building up the theory—the materials that, as we write, are growing into the history. We submit that at the present juncture, when new theories and new systems of notation are absorbing so much attention, the appearance of a journal which shall, in the respects already mentioned, differ from its contemporaaies and rivals, must be warmly welcomed by the class to which it addresses itself."

A Treatise on Coal and Coal-mining. By Warrington Smyth, F.R.S., Chief Inspector of the Mines of the Crown and of the Duchy of Cornwall. *(Virtue, Brothers.)*—Mr. Smyth explains all the operations of coal-mining, together with the lighting and ventilation of the pits, and the securing of them against accidents. The work contains information on the extent of the coalfields throughout the world, including even those of Australia, China, and India. The author maintains that, if things continue as they are going on at present, England will soon cease to have any advantage over some parts of the Continent in the price of coal, and Europe itself will be exhausted of its combustible minerals. He is of opinion that the present ratio of yearly increase in the exportation of coals will not be maintained, and that much may be done at home to stay our wasteful use of them.

Notes.

Gas Lighting.—At the last monthly meeting of the Glasgow Architectural Society, Mr. W. Johnston, of that city, read a paper "On Gas Lighting," in which he stated that the people of London tolerate the most clumsy and ill-fitted gas appliances in their shops and houses —gas so foul and coarse, street lamps of such imperfect construction, as would not be tolerated in any third-rate town in Scotland. He argued, from calculations which he laid before the meeting, and from the experience of Glasgow, that the London gas companies ought to be able to sell cannel coal gas at 5s. 5d. per 1,000 cubic feet, of a quality 2½ times better in illuminating power than that which they now supply at 4s. and 4s. 6d. At the conclusion of his paper he gave the following rules for consuming gas:—For coarse gas, use No. 5 fish-tail burners at moderate pressure; for cannel gas, Nos. 2 and 3 fish-tail burners; renew the burners frequently; check the pressure at the meter when it gets too strong; distribute new lights in all buildings instead of concentrating them in one spot; bring the lights as near as convenient to the place to be lighted; use in fitting, good full-sized gas pipes; select lamps which afford the least obstructions to the light; and above all, avoid trashy low-priced appliances for gas lighting. Dr. Frankland, in his lecture at the Royal Institution, on the 23rd of March, remarked on the bad quality of the gas supplied to London. He thought the public were not fairly treated by the gas companies. Sixteen years ago he had examined the London gas, and now he found it to be considerably worse than it then was. Had there been no improvements in this direction since that time? Undoubtedly there had, and any invention which decreased the cost of manufacture was eagerly seized, but those relating to improving the quality of the gas were entirely ignored. To obtain the same amount of light in London as is obtained in Edinburgh it was necessary to burn twice as much gas, to put up with twice as much heat caused by its combustion, and to inhale ten times as much sulphurous acid. No gas ought to be considered good enough for use which did not give a light equal to twenty standard candles when burning five cubic feet per hour.

Correspondence.

Cottage Building.—Sir,—Are you aware that at a meeting of the Society in May, 1850, the attention of the meeting was called to a model of a three-roomed labourer's cottage, erected by Mr. W. N. Clay, at Harlow, in Essex, at a cost, it was stated, of £10 only? The walls were described as formed of clay lumps, dried in the sun, having an admixture of straw in their composition; the roof was thatched, and the floor of concrete. Analogous modes of building, not only for cottages, but for houses of large size, in Cornwall, Hampshire, and the west of England, were mentioned by some members at the meeting, as well as the "Pisé work" used in Italy for churches and large buildings.—I am, &c., An Old Member.

Concrete Walls.—Sir,—In the short communication which appeared in the last *Journal*, respecting the cost of concrete dwellings, the printer has made an error, and placed "12 × 12 × 7," instead of 12 × 12 × 9, which is a very serious difference. I shall feel greatly obliged if you would cause it to be rectified. I wish to say a few words respecting Nicol's patent slabs, the principal advantages of which are—economy of construction and of space; the partitions in no case need be more than three inches thick, but the generality of them only 1½ inch thick. They also have the advantage of not absorbing water or damp, and of giving the easily-washable surface declared to be so desirable for hospitals. This may be of a light and cheerful appearance, so that no papering is required. The walling is, from its substance, highly non-conducting and warm, and the building can be inhabited without danger of fevers, &c., to which newly-built brick houses are liable if inhabited as soon as completed.—I am, &c., Samuel Sharp.

Flax and Flax Machinery.—Sir,—I am glad to find, by the report of the meeting of the 27th inst., that attention is again directed towards the cultivation and management of flax in England. The quantity and quality of flax fibre received from India has not been so satisfactory as was at one time anticipated, and it is now generally thought an effort should be made to extend the production in the British Isles. At present the prices paid for good flax fibre are very high, and should be amply remunerative to the farmer, under ordinary circumstances. The cost of scutching (or cleaning) has remained almost the same for years back, and this item of expense is not now so heavy in proportion to the value of the fibre as it was when I published my book on flax some years ago.* After many experiments and trials the old scutch mill is still preferred in this country, combined, however, with improved fluted metal rollers, for breaking the flax previous to the scutching operation. The old mill is now perhaps cheap enough, and the chief objection to it appears to be the unhealthy nature of the occupation, owing to the immense quantity of fine dust inhaled by the workers. Something might, no doubt, be done to correct this defect, by improved ventilation, &c. I fear there is little chance of a machine being invented that will not require skilled labour; the scutching process requires great judgment, and that cannot be had with untrained hands. The breaking machine alluded to on Wednesday evening is something like an American invention, introduced a few years ago into this country, with very moderate success. The scutching mill of Messrs. Rowan, described in my book (page 73), was not very unlike that recommended by Mr. Young; but it has not been generally adopted, and the old mill still carries off the palm in Ulster. If Mr. Young succeeds in perfecting an improved breaker and scutcher, he will confer a lasting benefit on the flax-growing community, and I wish him every success, though I feel the difficulties before him are, to say the least, serious. In the discussion at the meeting it was remarked by a speaker that the flax seed should be grown for crushing into cake. Now, experience here is in favour of using the bolls for feeding, and uncrushed. In fact, the flax is pulled before the seed is ripe. The seed being thus not mature, would, I fear, hardly pay, under these circumstances, for the expense of crushing; indeed most Irish growers still think the seed of so little importance, that in the majority of cases, I believe, it is never taken off at all, and completely lost in the watering process; a proceeding often defended on the plea that the fibre is improved by this mode of treatment, and will bring a higher price; the water is supposed to be made softer, and thus to act better in the retting process, owing to the presence of the oily seed; while it is further argued that taking off the bolls (or ripling) always, more or less, injures the ends of the fibre. I believe there is some truth in the latter assertion, but still ordinary care will prevent such an occurrence. I have every reason to think that the former idea, as to the water, is quite erroneous. There is, however, no doubt that ragweeds spread on the top of the flax in the steeping-pond have a good effect; and several farmers—who have lately tried the use of this common Irish weed in this way—have thanked me for the suggestion, and stated they observed a marked advantage. Another fact I may mention as worthy of notice is, that a large flax crop extracts from the soil very much the same ingredients as the turnip crop; consequently, if grown closely together in a rotation, these crops become exhaustive, and the produce limited. Between turnips and flax, in rotation, there should be four or five years, and between flax and flax again, six or seven. Unless this is attended to, and the details of cultivation carefully looked after, flax will likely disappoint the grower; but, with a moderate amount of intelligence and skill, a profit, varying from £3 to £20 per acre, can be realised.—I am, &c., William Charley, J.P.

Seymour Hill, near Belfast, April 3, 1867.

MEETINGS FOR THE ENSUING WEEK.

Mon......London Inst., 7. Prof. Westwood, "On Entomology."
Society of Engineers, 7½. Discussion on Mr. Henry Davey's paper, "On Pumping Engines for Town Water Supply."
Medical, 8.
Victoria Inst., 8.
Tues ...Civil Engineers, 8. Col. Sir Wm. Denison, "The Suez Canal."
Statistical, 8. Dr. Guy, "On the Mortality of London Hospitals, and, incidentally, on the Deaths in the Prisons and other Public Institutions of the Metropolis."
Pathological, 8.
Anthropological, 8.
R. Horticultnral, 3.
Wed ...Geological, 8. 1. Mr. Robert Etheridge, "On the Physical Structure of North Devon, and on the Palæontological Value of the Devonian Fossils." 2. Mr. W. Whitaker, "On Subaërial Denudation; and on the Cliffs and Escarpments of the Chalk and Tertiaries."
Thur ...Linnæan, 8. Dr. Cobbold, "On the Prevalence of Entozoa in the Dog; with remarks on their Relation to Public Health."
Zoological, 4.
Chemical, 8.
Fri ......Philological, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 22nd March, 1867.

45. Bills—Metropolis Gas.
81. " Houses of Parliament.
82. " National Gallery Enlargement.
124. Coolie Trade—Papers.
130. Army (Ration Stoppages)—Letter.
145. Poor Relief, &c. (Metropolis)—Return.

Delivered on 23rd March, 1867.

97. Board of Audit—Correspondence.
110. Civil Services—Treasury Minute.
111. Exchequer and Audit Departments Act (1866)—Return.
112. Exchequer Bills and Bonds—Treasury Minute.
133. Bullion—Return.
136. Parliamentary Boroughs—Returns.
141. Foreign Seamen and Apprentices—Returns.
149. Savings Banks (England and Wales)—Return.
M. Lamirande—Correspondence.
M. Lamirande—Correspondence with the Governor-General.
Turkey—Despatch from Lord Lyons respecting Reforms and Treatment of Christians.
Public Petitions—Eleventh Report.

Delivered on 25th March, 1867.

85. Bills—Policies of Insurance.
136. Parliamentary Boroughs (corrected pages).
143. Farmhouses—Return.
147. Private Bill Committees—Return.

Delivered on 26th March, 1867.

84. Bill—Ecclesiastical Titles Act Repeal.
132. Registrars (Ireland)—Return.
Church Estates Commission—Sixteenth Report of Commissioners.
Ecclesiastical Commission—Nineteenth Report of Commissioners.
The "Tornado"—Correspondence (Part III.).

Delivered on 27th March, 1867.

122. Queen Anne's Bounty—Returns.
138. Offices of Profit—Return.
The "Tornado"—Correspondence (Part IV.).
Public Petitions—Twelfth Report.

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* "Flax and its Products." Bell and Daldy, 1862.

Delivered on 28*th March*, 1867.

86. Bills—Bridges (Ireland).
88. ,, Metropolitan Water Supply.
90. ,, Promissory Notes (Ireland).
93. ,, Trades' Unions (Lords Amendments).
123. Harwich Harbour—Abstract of Accounts.
144. Agricultural Holdings (Ireland)—Returns.
British North America (Canada Railway Loan)—Correspondence.

Patents.

From Commissioners of Patents' Journal, April 5th.

GRANTS OF PROVISIONAL PROTECTION.

Anchors, tackle for weighing, &c.—723—F. R. A. Glover.
Bale fastener—751—A. V. Newton.
Beer-engines—724—M. Henry.
Belt fastener—760—W. R. Harris.
Boilers and safety-valves—779—W. H. Parsons.
Boxes—740—W. E. Newton.
Brakes—821—L. Latter.
Bread, &c., preparation of—766—J. Hickisson.
Brushes, rotating—767—S. Holness.
Candles, securing—726—W. Wootton.
Candlesticks—735—S. Clarke.
Capsules—3245—A. S. Stocker.
Carriage heads, apparatus for raising—784—E. Harvie.
Cartridges—805—M. A. F. Mennons.
Cartridges—820—W. Clark.
Cast-iron, annealing—763—J. Kennedy.
Cereals, decorticating—832—W. W. Gibson.
Chloride of lime, manufacture of—728—B. Platt.
Chronometers, &c.—824—W. E. Newton.
Coal, &c., boring and excavating—733—W. Read.
Coffee percolators—828—W. R. Lake.
Collars (paper), &c.—829—C. Kaufmann.
Cooking apparatus—746—W. H. Graveley and J. Ewing.
Coolers for liquids—817—H. Clifton.
Core bars and studs—813—D. Y. Stewart.
Covers for jars, &c.—826—W. D. Player.
Cramping and lifting apparatus—742—J. P. Bagaranwath.
Cranes—844—R. Duncan.
Digging machines—859—G. Davies.
Disinfecting, &c., apparatus—729—J. C. Morrell.
Door-knobs—804—T. K. Mace.
Dyeing, &c.—743—J. Keymer and W. Whitehead.
Electro-magnetic, &c., machines—842—H. Wilde.
Engines, heated air—776—F. H. Wenham.
Engines, rotary—755—W. R. Lake.
Fabrics, &c., apparatus for exhibiting—811—G. Chambers.
Fabrics, textile—815—J. Booth.
Fences, &c.—831—P. Dickenson.
Fibrous materials, printing skeins of—795—J. H. Johnson.
Fire-arms, breech-loading—731—M. F. Halliday.
Fire-arms, breech-loading—761—M. A. F. Mennons.
Fire-arms, breech-loading—768—T. Shedden.
Fire-arms, breech-loading—769—A. V. Newton.
Furnaces—830—G. Cross and R. Evans.
Furnaces, &c.—840—S. Sedgwick.
Furnaces, supplying heated air to—741—W. Hamer and J. Davies.
Gas, artificial material for producing—721—J. Hamilton.
Gas retorts, removing carbon from—790—J. Hislop.
Glass, globular, &c.—835—E. S. Tucker.
Gun locks—781—J. Smith.
Guns, breech-loading drop—800—J. Portlock.
Hats, pouncing—758—E. Nougaret.
Knife-grinders—765—R. Canham.
Knives, &c.—843—W. H. Rayner and J. T. Heath.
Lamp extinguisher—855—G. T. Bousfield.
Liquids, measuring—720—T. and T. F. Walker.
Looms—812—J. Leeming.
Machinery, ascertaining speed of—736—J. B. Dancer.
Machinery for raising, &c., heavy bodies—822—J. A. Limbert.
Machinery, ironing, pressing, &c.—793—J. M. Clements.
Metal tubes, coating—865—A. Parkes.
Metals, coating—810—G. Bischof.
Oils, heating and illuminating—391—J. Y. Simpson.
Photographic pictures—825—H. W. Hart.
Photographic pictures, &c.—849—E. Edwards.
Pianofortes—778—H. Simms.
Pictures, &c., on glass, &c.—732—E. Lee.
Pyrites, &c., mode of treating—789—C. Allhusen.
Railway tickets, printing—839—G. Adams and W. T. Whiteman.
Refrigerators, &c.—818—H. Clifton.
Reins—853—J. G. Tongue.
Retorts and cylinders, apparatus for driving—802—P. T. Goodwin.
Retorts, charcoal—738—P. T. Goodwin.
Rollers—725—G. Rumbelow and H. Kendall.
Safety apparatus—754—J. P. Harper.
Safety-valves—785—C. F. Cooke.
Screw-propellers—739—J. Ferguson.
Sea-water, distilling—3165—S. J. Browning.
Sewage, apparatus for purifying—788—A. H. Hart and W. Parry.
Sewing machines—792—A. V. Newton.
Sewing machines—806—S. M. Tyler.
Ships, &c., measuring speed—663—M. Henry.
Ships, iron, protection from corrosion, &c.—745—J. Westwood and R. Baillie.
Ships' pumps, working—727—J. Griffiths.
Signalling apparatus, &c.—730—W. Esplen and J. J. B. Bland.
Silver, extracting—737—W. G. Blagden.
Smoke, prevention of—762—J. Grundy.
Soap, preparing—752—G. Smith.
Spades, &c., handles of—803—J. W. Yates.
Spinning flax, &c.—837—J. Lawson.
Spinning machinery—750—W. E. Newton.
Stay busks, fastening and unfastening—701—L. C. Sodeman.
Stays—857—T. Pebardy.
Steam boilers, preventing incrustation in—774—J. Smith.
Steam-engines and boilers—771—E. E. Allen.
Steam-engines, marine—747—E. P. Plenty.
Steam fire-engines and boilers—772—J. Shand.
Steam road rollers—796—T. Aveling.
Steering apparatus—764—G. Hutson.
Telegraphs, printing—816—J. H. Simpson.
Transparent pictures—705—T. Hatton.
Travelling trunk, bath, and cradle combined—773—W. H. Bailey.
Turnips, &c., preparing—734—H. Smith.
Umbrellas, &c.—845—J. H. Soller and E. Barber.
Urinals, &c.—823—W. Lorberg.
Valves, &c.—836—J. Whitley.
Valves, slide—759—J. Milner.
Varnish for healds of looms—744—J. R. Parkinson.
Vegetable fibres, disaggregation of—799—W. Clark.
Ventilating and steam-heating apparatus—827—G. Haseltine.
Ventilating and warming buildings—791—M. Semple.
Ventilating public buildings—722—W. E. Newton.
Watches, apparatus for protecting—808—B. J. Smith.
Weaving—780—D. Ellis and M. Hillas.
Wood, &c., preservation of—811—G. E. Marchisio.
Wool, &c., combing—834—G. Little.
Wool, &c., treatment of—861—J. H. Johnson.
Wool, dyeing—748—J. H. Johnson.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Paper machinery—971—F. Curtis.
Railway brake—975—H. A. Bonneville.

PATENTS SEALED.

2578. W. Clark.
2582. J. H. Roberts.
2595. J. Greening.
2596. J. W. Baker.
2597. J. Monnin, C. Bosc, and C. A. Boissenot.
2598. H. Forbes.
2599. W. E. Gedge.
2601. M. Mirfield and J. Scott.
2603. J. Conlong.
2606. G. W. Shinner.
2607. T. Outram.
2609. C. J. Hill.
2620. J. Bullough.
2638. D. Evans.
2659. G. Lake.
2720. J. G. Tongue.
2958. A. V. Newton.
3058. A. V. Newton.
3214. J. Williamson.
10. J. Plews.
100. W. Clark.
160. F. C. Rein.

From Commissioners of Patents' Journal, April 9th.

PATENTS SEALED.

2619. M. Myers.
2625. E. B. Wilson.
2628. D. Crichton, W. Donbavand, and D. Crighton.
2635. H. Jones.
2645. E. Beanes.
2649. L. R. Bodmer.
2650. L. R. Bodmer.
2654. W. Rosseter.
2655. S. Collins.
2656. J. and J. G. Dale.
2660. J. Giles.
2670. W. H. P. Gore.
2686. C. A. Girard.
2737. G. Haseltine.
2739. W. R. Lake.
2741. J. Ogden.
2744. J. Watts.
2756. H. Phillips.
2773. J. Wagener & G. J. Firmin.
2831. W. S. Ashton & J. Johnson.
2894. W. Goodbrand and T. E. Holland.
3077. J. and W. Kitchen and S. Samuels.
3135. G. Howard.
3150. W. W. Pilcher.
3383. J. R. Cooper.
220. C. Wheatstone.
309. S. Plant and W. Tatton.
323. A. V. Newton.
357. M. J. Haines.
463. G. Haseltine.
465. W. R. Lake.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

816. C. Sanderson.
839. T. Bourne.
776. E. Grether.
834. L. Cooke.
837. J. Smith.
861. W. T. C. Pratt.
896. J. Dodge.
850. J. Platt, E. Spencer, and J. Dodd.
875. C. Beard.
897. A. B. Brown.
925. F. A. Gatty.
865. J. F. Sharp.
863. J. H. Johnson.
1233. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

887. H. Bridle.
891. T. Aveling.
886. J. Hamer.